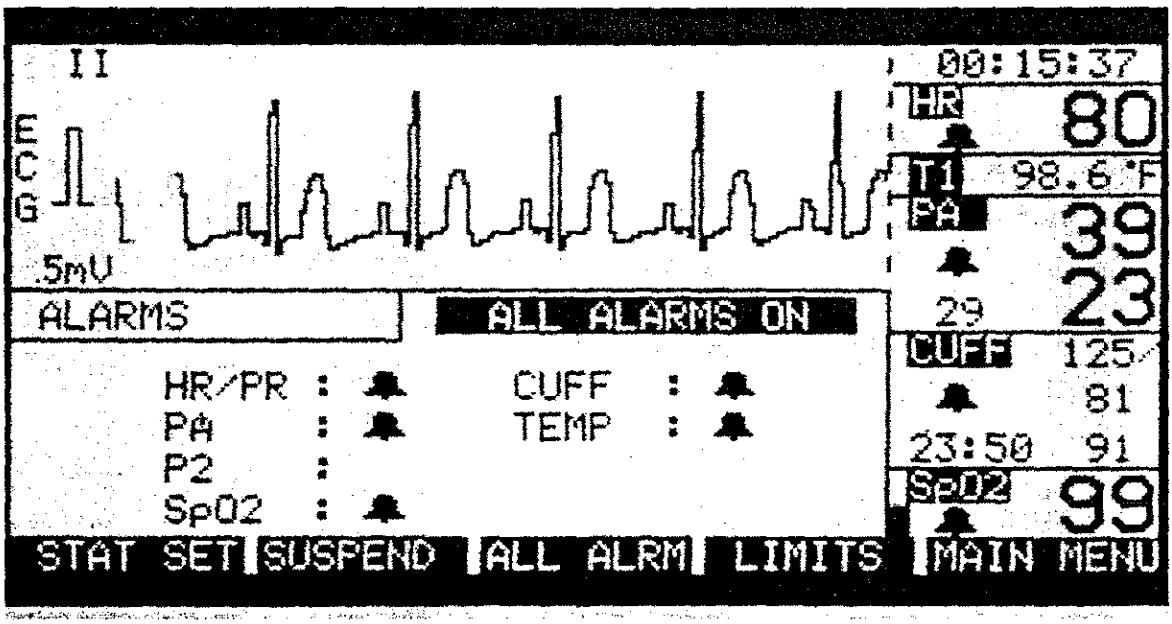
3 ▪ Propaq Alarms & Limits

The Alarms Status Window & Alarms Menu

The alarms status window and Alarms Menu appear when you press ALARMS in the Main Menu. These give you immediate indications and control of the Propaq's alarms.

Alarms Status Window

The alarms status window (shown in the figure below) indicates the alarms status of each vital sign parameter. The presence of a bell (full or half) shows you that alarm limits are turned on and set for the vital sign parameter. The full bell indicates all alarm limits are turned on. The half bell indicates at least one alarm limit is turned off. The absence of a bell shows you that no alarm limits are turned on. Bells only appear when at least one limit is turned on *and* the vital sign parameter is being monitored.



Alarms Menu

The Alarms Menu below the status window lets you access other functions to automatically set alarm limits or individually set them. The menu also lets you silence the alarm tone that occurs when a limit is violated.

The Different Kinds of Propaq Alarms

The Propaq can alert you to changing patient conditions (Patient Alarms) and changing equipment conditions (Equipment Alarms). Both require your attention.

Patient Alarms: Definitions & Indications

The Propaq can alert you to changing patient conditions through its easily programmable alarm functions. Once you set alarm limits, any vital sign that violates any of its limits results in both audible and visual alarm indications. The Propaq also shows you when *any* alarm limit is turned off by illuminating the amber *ALARM(S) OFF* light. The table on the following page summarizes the Propaq alarm indications. The following information provides details on the Propaq alarms.

A high-pitched, clearly audible alarm tone sounds whenever a limit is violated. The alarm tone continues until

- the *patient condition changes* and no longer violates the limit,
- you *suspend the alarm* tone by pressing the SUSPEND button,
- you *reset the alarm limit* so the vital sign does not violate it,
- you *turn off* the violated alarm limit.

ALARM	*ALARM(S) OFF*	Tone	Numeric	Bell	Condition
OFF	ON	OFF	ON	OFF	No alarm and alarms off.
ON	ON	ON	FLASH	ON	Patient alarm and at least one alarm on.
ON	OFF	ON	FLASH	ON	Patient alarm and all alarms on.
ON	X[a]	OFF	ON	ON	Temporary Patient alarm. Check Alarms Parameter window for parameter that caused alarm.[b]
OFF	FLASH	OFF	ON	X[c]	No alarm and alarms suspended.
FLASH	OFF	OFF	FLASH	ON	Suspended patient alarms.

[a] The state of this light doesn't matter for the condition.

[b] To turn off the *ALARM* light, view each alarms parameter window until you find the limit with an asterisk (*) next to it. This limit caused the alarm. (It is possible to have more than one parameter cause a temporary alarm.) The asterisk(s) are cleared when the alarms parameter window is removed by pressing MAIN MENU.

[c] The state of the bell (ON or OFF) indicates whether alarms were on or off before they were suspended.

Visually, the alarm limit violation is indicated by the illuminated red *ALARM* light on the front panel and by the slowly flashing vital sign numeric that violates the limit. When the alarm first occurs, a Patient Alarm Menu is displayed allowing you to immediately respond to the condition. The figure on the following page illustrates the visual indicators and the Patient Alarm Menu.

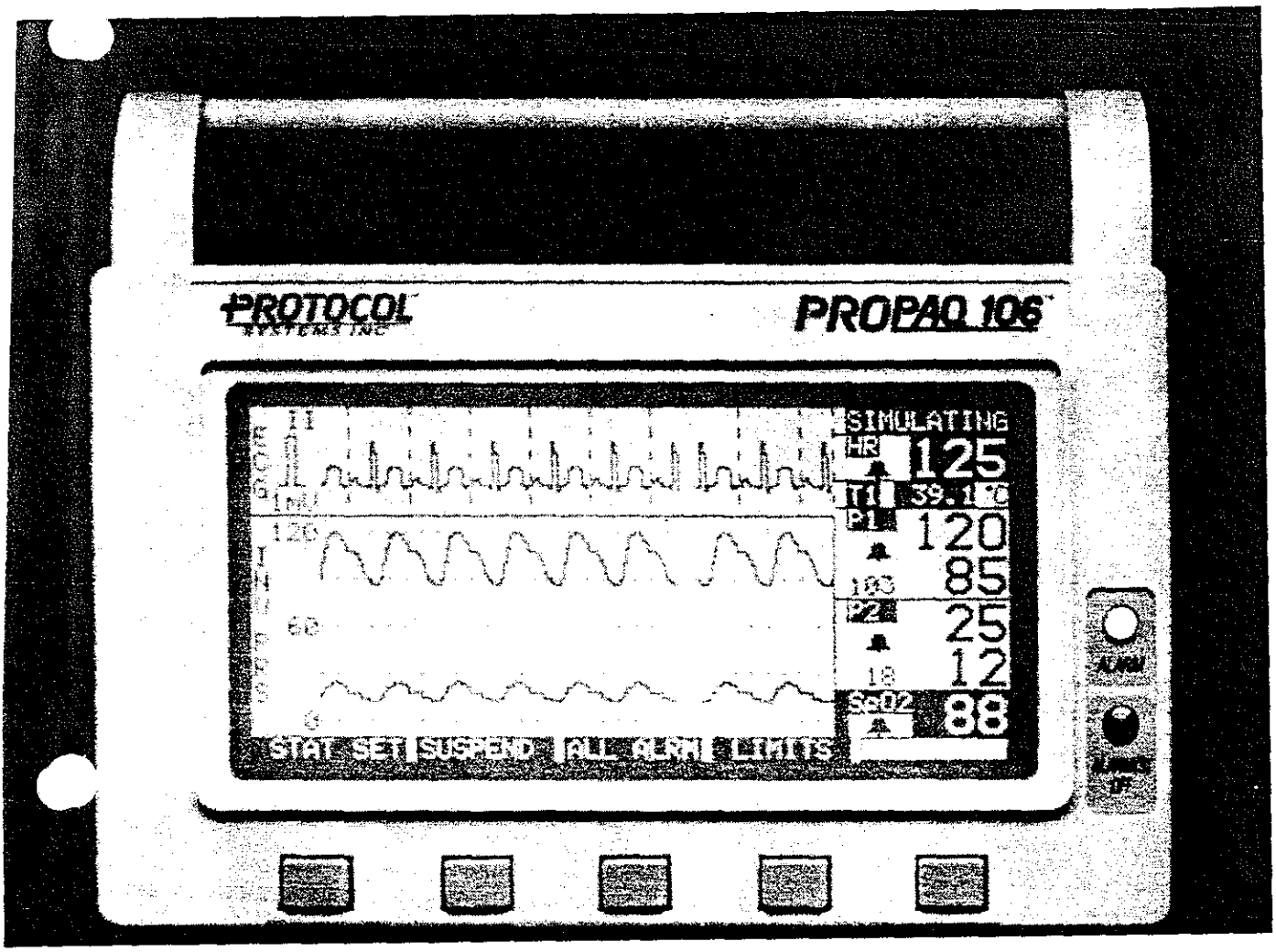
The Propaq's ultrasmart capabilities include being able to let you know when a patient's condition changed, causing an alarm to occur in your absence, but later changed again and no longer violates a limit. An example of this might be a run of tachycardia for a short time while you were not with the patient. With the Propaq, you can isolate the violating vital sign and note it in the patient's records, or reset the alarm limits if you feel the condition does not warrant you being alerted at each occurrence. You can also have the Propaq automatically print the patient's vital sign information when an alarm occurs. (See *Printing When a Patient Alarm Occurs* later in this chapter.)

The Propaq indicates such a temporary alarm with the red *ALARM* light. During the alarm condition, both the alarm tone and visual indicators are activated. But after the patient's condition returns to *normal* (as set by the alarm limits), the tone and flashing numeric stop, however, the red alarm light remains illuminated. The section *Responding to Patient Alarms* in this chapter describes how to determine which vital sign caused a temporary alarm.

Responding to Patient Alarms

During a **patient alarm**, typically the first thing you will want to do is temporarily turn off the alarm tone. You can immediately do this by pressing the SUSPEND button in the Patient Alarm Menu, which is automatically displayed as soon as the alarm occurs. The tone is suspended only for 90 seconds. After that period, the tone will again sound if the alarm condition still exists. You can "unsuspend" the alarm by pressing the RESUME button in the Alarms Menu. If an alarm condition still exists, the tone will again sound.

As soon as you turn off the tone, the Patient Alarm Menu is removed, and the red *ALARM* light begins to slowly flash, indicating a suspended patient alarm condition. If you were looking at the patient's trends on the Propaq or making some other monitor setting adjustments prior to the alarm, whatever was displayed prior to the alarm is again displayed.



During a patient alarm condition, the red ALARM light turns on, an alarm tone sounds, and the numeric on the display slowly flashes. The Patient Alarm Menu appears allowing you to respond to the alarm. Typically, you will first silence the alarm tone with the SUSPEND button. After pressing SUSPEND, the Propaq display will show what appeared before the alarm occurred.

Once the alarm tone has been suspended and the patient's condition has been assessed and responded to, you can make Propaq alarm adjustments if necessary. Possible adjustments in order to cancel the alarm are (the buttons you press to achieve the following results are indicated in parentheses):

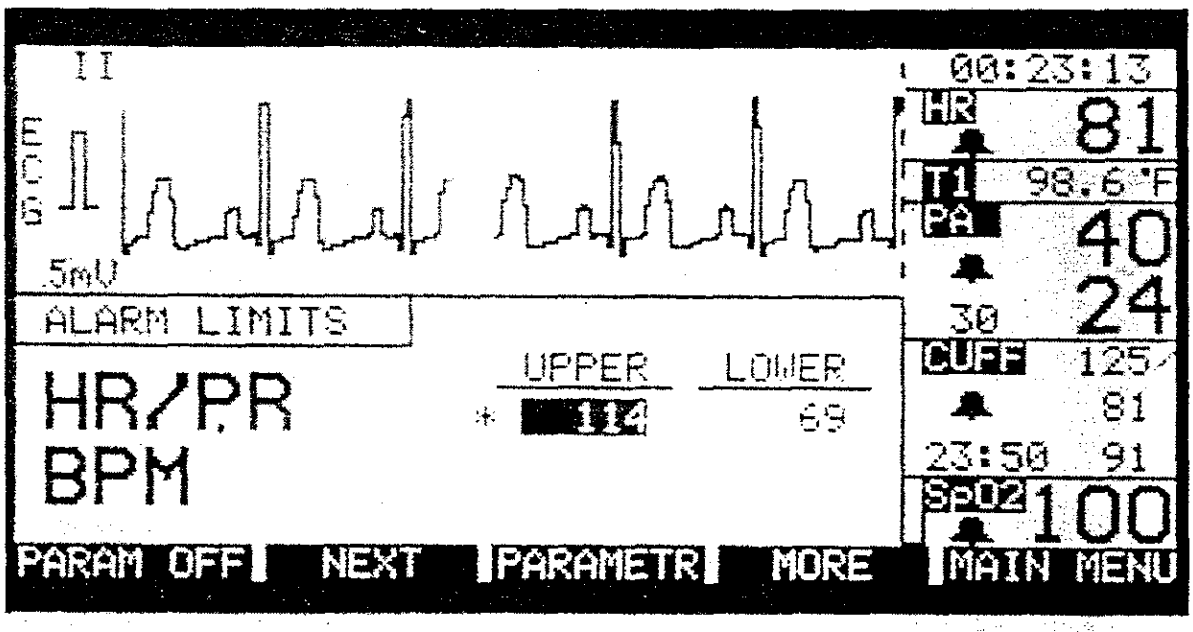
- turn off all alarm limits by pressing ALL ALRM in the Alarms Menu (ALARMS > ALL ALRM)
- automatically recalculate and reset all alarm limit values so they don't produce a violation by pressing STAT SET in the Alarms Menu (ALARMS > STAT SET)
- turn off the alarm limits only for the violating vital sign by pressing PARAM OFF in the Limits Menu once you've selected the appropriate vital sign *limits window* (ALARMS > LIMITS > PARAMETR > PARAM OFF); all limits for the violating vital sign are turned off
- automatically recalculate and reset the limits only for the violating vital sign by pressing PARAM OFF and then PARAM SET in the Limits Menu once you've selected the appropriate vital sign limits window (ALARMS > LIMITS > PARAMETR > PARAM OFF > PARAM SET)
- manually change the violated alarm limit value by selecting the violated limit value and adjusting it or turning it off (see *Setting Alarm Limits* below)

During a **temporary alarm,** typically you will first want to find out which vital sign violated its limit. (Since the condition that caused the alarm no longer exists, the alarm tone no longer sounds and the Patient Alarm Menu is not displayed.) To find the violating vital sign, you locate the alarm limit value with an asterisk character (*) displayed next to it. The steps are simple:

☞ Press ALARMS and then LIMITS to display the first limits window.

☞ Once the asterisk is located, the *ALARM* light turns off.

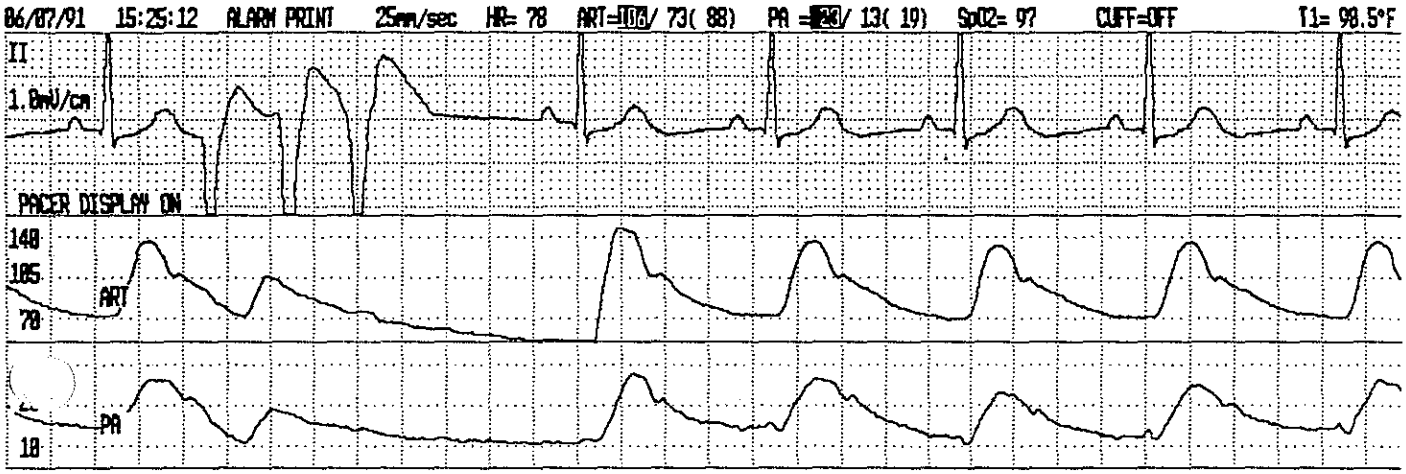
☞ If an asterisk is not shown in this window, press PARAMETR until the asterisk is located.



To find the violating vital sign of a temporary patient alarm, use the Limits Menu buttons (shown above) to find the alarm limit with an asterisk next to it. Press ALARMS, then LIMITS, and then PARAMETR until you find the window with an asterisk in it. If multiple limits are violated, there will be more than one limit with an asterisk.

...nting When a Patient Alarm Occurs

If your Propaq monitor includes the optional Expansion Module with Printer (EMP), you can have the Propaq print the patient's vital signs information whenever a patient alarm occurs. The printout includes waveforms and patient numerics for 20 seconds: the first 12 seconds of the printout shows the patient's condition prior to the alarm; the last 8 seconds shows the patient's condition from the start of the alarm. The following figure illustrates a typical patient alarm printout.



The alarm printout shows 20 seconds of patient vital sign information: the first 12 seconds shows the patient's condition prior to the alarm; the last 8 seconds shows the patient's condition since the alarm occurred.

To set up the printer to print on a patient alarm, follow these steps.

☞ From the Main Menu, press the following buttons: SYSTEM > PRINTER

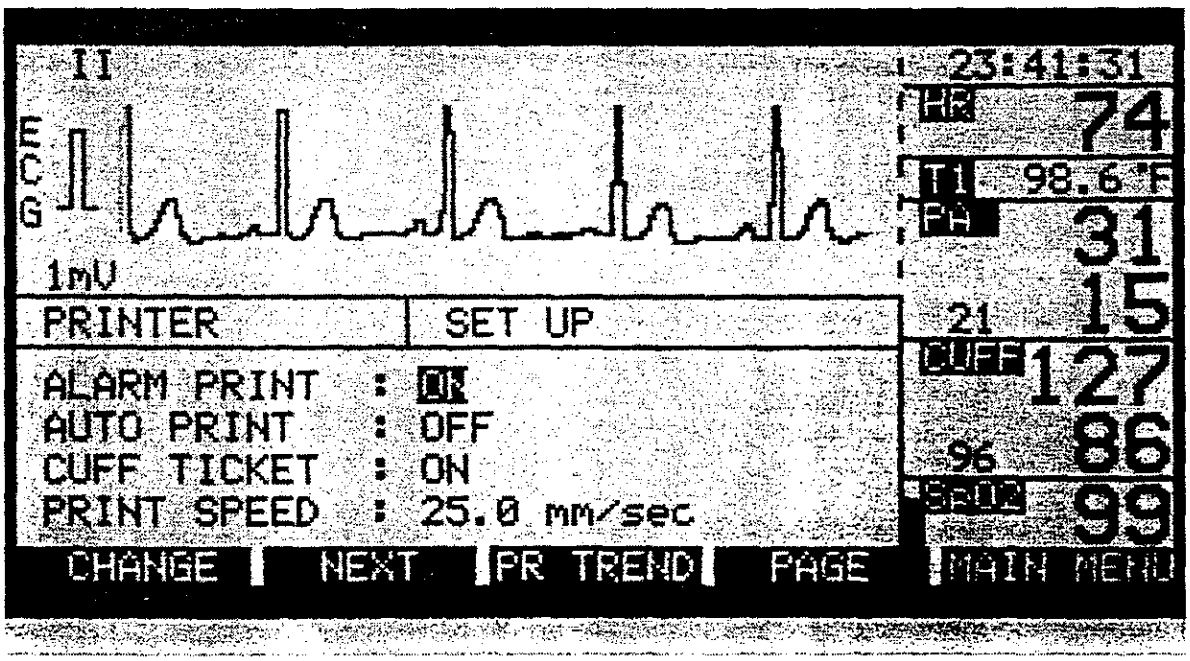
☞ The printer status window appears (see the figure below)

Use the Printer Menu's NEXT button to select ALARM PRINT in the printer status window.

☞ Press the CHANGE button until ALARM PRINT is set to ON.

☞ Press the MAIN MENU button.

Make sure the printer contains enough paper. See *Changing Printer Paper* in Chapter 5 if you need instructions for changing the paper.

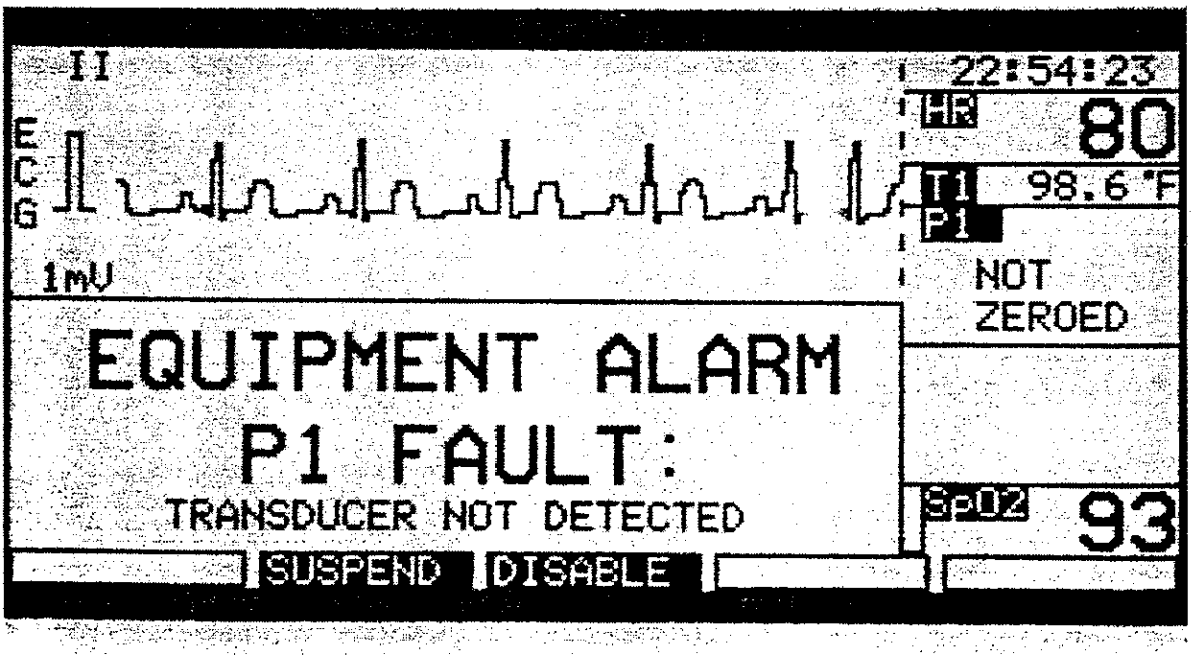


The printer status window shows how the printer is set up to print. When ALARM PRINT is set to ON, the printer will print a 20 second strip whenever a patient alarm occurs.

Equipment Alarms: Definitions & Indications

The Propaq can alert you to changing equipment conditions, such as disconnected or faulty sensors, low battery voltage, lost programmed settings, and many other conditions that can affect patient monitoring. An equipment alarm results in audible and visual indications.

If an equipment alarm condition is detected, a high-pitched, clearly audible alarm tone sounds for one second followed by four seconds of silence. This alarm tone pattern repeats until you respond to the equipment alarm or the equipment condition is corrected. In addition, an *equipment alarm window* and Equipment Alarm Menu appear on the display identifying the faulty equipment condition. Some equipment conditions also result in a caution message alternating with the time of day above the heart rate. The table on the following page lists what conditions result in a caution message. An example of an equipment alarm window and caution message is shown below.



The equipment alarm window appears whenever the Propaq detects a change in equipment condition that affects patient monitoring.

ıution Message	Condition	Required Action
LOW BATT	Low battery voltage.	Connect power adapter.
ECG FAULT	Faulty ECG lead connections.	Check leads, electrodes, and ECG cable.
P1 FAULT	Faulty invasive pressure transducer or connector for channel 1.	Check transducer and cable. Correct problem. Rezero channel.
P2 FAULT	Faulty invasive pressure transducer or connector for channel 2.	Check transducer and cable. Correct problem. Rezero channel.
T1 FAULT	Shorted temperature probe or temperature is out of range for channel 1.	Check probe and cable.
T2 FAULT	Shorted temperature probe or temperature is out of range for channel 2.	Check probe and cable.
C FAULT	Various CUFF problems. See Cuff Messages in Chapter 2.	
SIMULATING	The Propaq is displaying simulated patient data. If printed, SIMULATED DATA appears on the printout.	To cancel, connect a sensor, press AUTO in the Cuff Menu, or turn off and then on the Propaq.
PRNT FAULT	The printer is out of paper, the paper door is open, or the print head is too hot.	Replace paper if necessary and close paper door.
SpO2 SRCH	The Propaq cannot detect the blood pulses in the sensor site.	Check the sensor and make sure circulation to the sensor site is adequate. Once circulation is adequate, the Propaq displays the SpO_2 value.
NO C-LOCK	SpO_2 is active, C-Lock function is turned on, ECG is not working.	Check all ECG lead wires, electrodes, and cable.

The equipment alarm tone continues to sound and the window remains on the display until

- the equipment condition is corrected
- you suspend the alarm tone by pressing the SUSPEND button
- you disable the patient channel by pressing the DISABLE button

Some equipment conditions resulting in an equipment alarm also interrupt normal patient monitoring and cause a patient alarm. Patient alarms always take precedence over an equipment alarm. If an equipment alarm occurs followed by a patient alarm, the Patient Alarm Menu is automatically displayed with the equipment alarm window above the menu.

Responding to Equipment Alarms

During an equipment alarm, typically the first thing you will want to do is temporarily turn off the alarm tone. You can immediately do this by pressing the SUSPEND button in the Equipment Alarm Menu. The tone is suspended for 90 seconds. After that period, the tone will again sound if the alarm condition still exists. If the equipment alarm also resulted in a patient alarm, typically you will first want to suspend the tone and then assess the patient and the equipment.

For some equipment alarms, such as a lead failure caused by patient movement pulling off a lead wire from its electrode, all that is necessary is to correct the condition. The Propaq immediately recognizes the corrected condition and resumes normal monitoring.

Other equipment conditions, such as a faulty transducer, require more attention. In such cases, if the equipment condition also caused a patient alarm, you will need to first suspend the alarm tone by pressing SUSPEND. Then you can disable the affected patient channel by pressing the DISABLE button. All numerics and waveforms associated with the channel are removed from the display. However, the Propaq remembers the alarm limits and other settings for the channel. Although the channel has been disabled, the trended data is still saved. You can then replace the sensor or take whatever action is necessary.

After you have replaced a sensor, the Propaq automatically detects the new sensor and activates the patient channel, resuming normal monitoring. If you replace a pressure transducer, the Propaq resumes monitoring after the transducer has been zeroed. The Propaq returns the channel to its settings prior to the equipment alarm. If a patient alarm occurred and you turned off any alarm limits, you will need to turn them back on. You can quickly assess which alarm limits are turned on by press ALARMS in the Main Menu. See *Setting Alarm Limits* next in this chapter.

¤ Setting Alarm Limits

The Propaq allows you to quickly set alarm limits with minimal button pushes, and also gives you complete control over individual limits for tailoring each vital sign alarm limit according to your protocols.

The Quickest Way to Set Limits (STAT SET & PARAM SET)

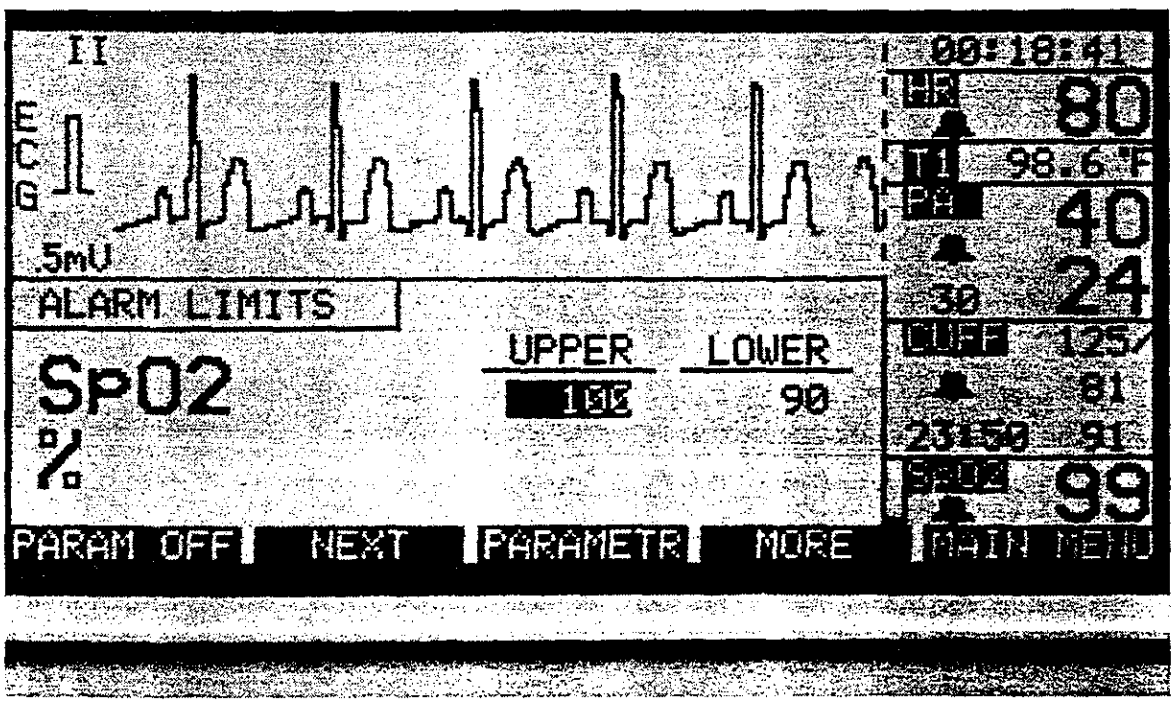
When it is necessary to immediately set alarm limits, such as when the Propaq is being used in emergency medical services, you simply press the STAT SET button in the Alarms Menu (ALARMS > STAT SET). The Propaq quickly turns on all alarm limits and calculates the alarm limits for all vital signs that are being monitored. The calculated values are based on the patient's current status as shown in the following table.

Parameter	Lower Limit	Upper Limit
Heart Rate	HR X 0.8 + 5	HR X 0.8 + 50
Cuff Systolic	SYS X 0.68 +11	SYS X 0.86 + 38
Cuff Diastolic	DIA X 0.68 + 6	DIA X 0.86 +32
Cuff Mean	MN X 0.68 + 8	MN X 0.86 + 35
Inv. Press. ≤25	Inv. Press - 5	Inv. Press. + 5
Inv Press. = 26 to 99	Inv. Press. X 0.8	Inv. Press. X 1.2
Inv. Press. ≥100	Inv. Press. -20	Inv. Press. +20
Temperature	Temp. - 0.5	Temp. + 0.5
SpO_2 <95	SpO_2 - 5	100
SpO_2 ≥95	90	100

The Propaq can detect when a vital sign is being monitored. If a vital sign is not monitored and the Propaq automatically turns on alarm limits for that vital sign parameter, the Propaq does not initiate a patient alarm. However, if you do begin monitoring a vital sign for which alarm limits have been set, and the vital sign values violate any alarm limit, the Propaq will initiate a patient alarm.

If you need to quickly set alarm limits for just one vital sign, you use the PARAM SET button. PARAM SET automatically calculates the alarm limits in the same way STAT SET does, however, PARAM SET only affects the vital sign parameter you select with the PARAMETR button.

For example, if you were monitoring ECG and noninvasive blood pressure and had used STAT SET to set the alarm limits, *all alarm limits for all parameters* would be set. If later you begin to monitor oxygen saturation using pulse oximetry, you can quickly set all alarm limits by pressing STAT SET again. Or, you could set alarm limits for just pulse oximetry by pressing ALARMS, then LIMITS, and then PARAMETR until the SpO_2 vital sign parameter window appeared as shown in the following figure. Notice in the figure that there is no PARAM SET button, but there is a PARAM OFF button. This button performs both functions for setting all alarm limits for the parameter and turning them off.



When *any* alarm limit for a parameter is turned *on*, this button is the PARAM OFF button. When *all* alarms for the parameter are *off*, the button is the PARAM SET button. To automatically set the alarm limits for just this parameter, press the PARAM OFF button twice—once to turn off the alarm limits (the button then becomes PARAM SET) and again to automatically set the limits. This may seem to take more time than just pressing STAT SET, but if you have manually refined the alarm limits for some parameters after pressing STAT SET, you wouldn't want the Propaq to reset all the limits and then have to manually refine them again. With just two button presses, the limits are set for the desired vital sign parameter.

Turning On & Off All Limits

Whenever you press STAT SET or PARAM SET, the Propaq calculates the alarm limits and turns them on. If you only want to turn all limits on and off, without changing their values, press the ALL ALRM button in the Alarms Menu. The alarms status window lets you know when all alarms are on or off with both a message and the bells.

Changing Individual Limits

Sometimes it is necessary to set or change a single alarm limit. Or, your hospital's protocols may not follow the protocols the Propaq uses to calculate alarm limits. You must then set each alarm limit according to your hospital's protocols, or program the Propaq to turn on with the limits you want.

Setting each limit is a simple process which includes (1) select the desired vital sign parameter window, (2) select the limit to adjust, (3) select the Limits Adjust Menu, and (4) change the limit.

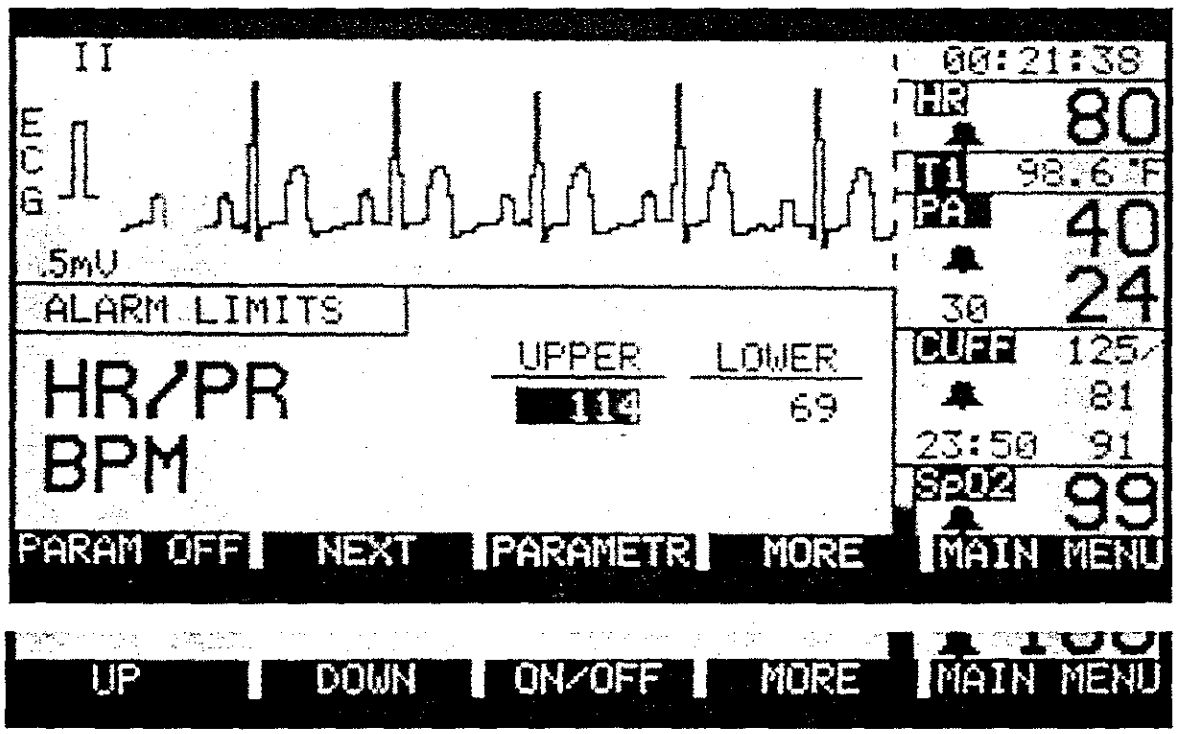
☞ From the Main Menu, press ALARMS.

☞ Press LIMITS to display the alarm limits window and the Limits Menu (see the figure on the following page).

☞ Press PARAMETR to change to the desired alarm limit window.

☞ Press the NEXT button to move the cursor. Continue to press NEXT until the desired limit is selected.

- ☞ Press the MORE button to select the Limits Adjust Menu. If the limit was turned off, pressing MORE automatically turns on the limit.
- ☞ Press UP or DOWN to adjust the limit to the desired limit value.
- ☞ When the limit is set, press the MORE button again to move to the next limit and to return to the Limits Menu.
- ☞ If the cursor selects the limit you want to adjust, press the MORE button again to adjust that limit.
- ☞ Continue the process until you've set all the limits you want.
- ☞ Repeat the process using the PARAMETER, MORE, NEXT, and UP and DOWN buttons to adjust all the necessary limits.



Adjusting individual limits is done through the alarm limits window and the Limits and Limits Adjust Menus.

Programming Propaq Alarm Limits

Although setting the Propaq's alarm limits can be automatic with STAT SET and PARAM SET, you can also program the limits you want to appear every time you turn on the monitor. If, for example, patients in your unit are typically stable enough that you generally set alarm limits to the same values for nearly every patient, you can program these values into the Propaq so that when you begin monitoring, the alarm limits are already set. You only need to check that the alarms don't need minor adjustment because of the patient's condition.

When you program the alarm limits, you also program several other Propaq settings, including display settings, such as contrast and wave selection, and all vital sign parameter settings, such as heart rate tone, heart rate source, sweep speed, and temperature units to name just a few. So when you want to program the alarm limits, be sure you check all Propaq settings to ensure they are set as you want them each time you turn on the Propaq. Programming the Propaq is described in Chapter 1. You should always follow the programming instructions in Chapter 1 to be sure you program the Propaq exactly the way you want.

APPLICATION HELP
The best way to really become efficient at setting Propaq alarms is to use the Propaq's INSERV mode. You can use the simulated data to set and change alarms, and to practice responding to patient and equipment alarms. See Chapter 1 for more information on the INSERV mode.

4 ▪ Propaq Trends

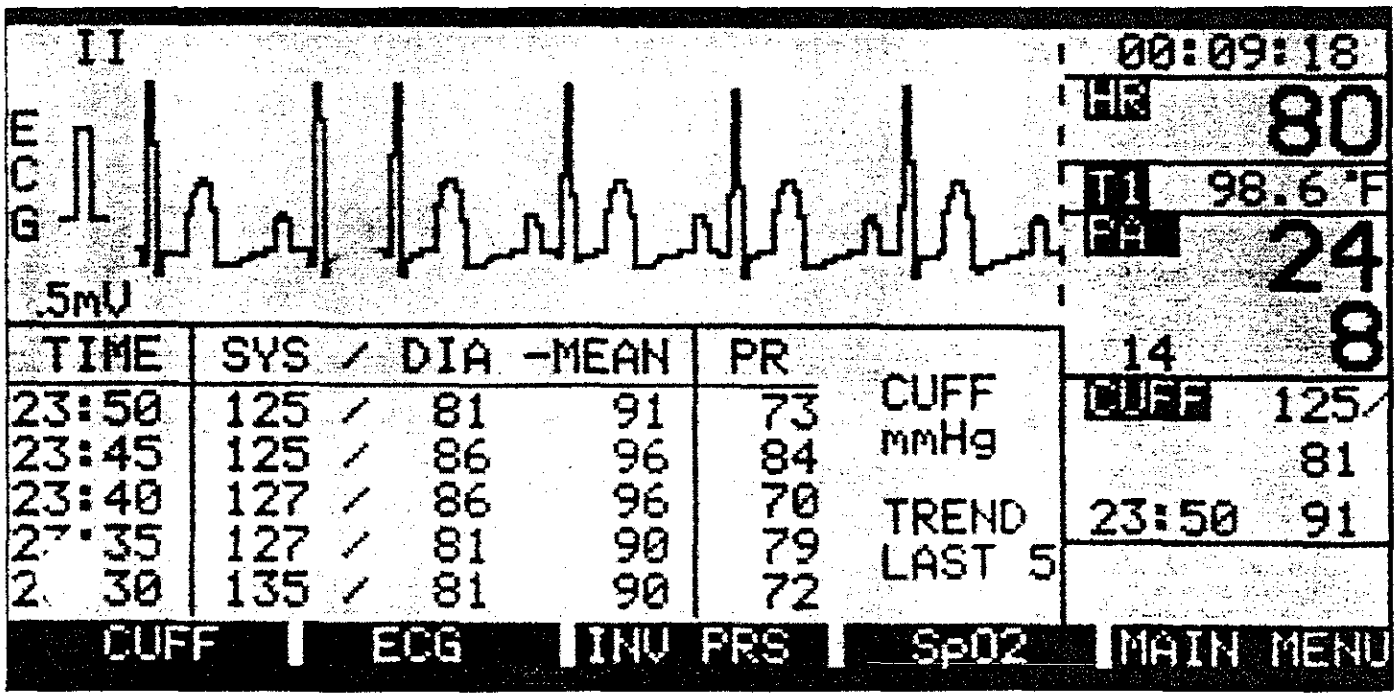
The Different Kinds of Trends

The Propaq can show you a patient's vital signs over the last several hours. Every two minutes, the Propaq averages the monitored vital signs and stores them in its trend memory, which can save the last eight hours of trend information. All this information can be printed on the Propaq Printer and viewed as a trend print. The last five hours of data can be viewed on the display. You can view trends either as a table (tabular trends) or as a graph (graphical trends).

Tabular Trends

A tabular trend shows you the last several readings as a table. Currently, you can only view noninvasive pressure as a tabular trend. An example of a tabular trend is shown in the following figure.

Notice in the figure that the table shows the time, systolic, diastolic, and mean pressures, the pulse rate determined for each cuff measurement, and the SpO_2 value at the time the cuff measurement was taken (if available). If the Propaq was set to automatically take noninvasive pressure measurements at a selected interval, you can easily determine the interval by checking the time interval column.



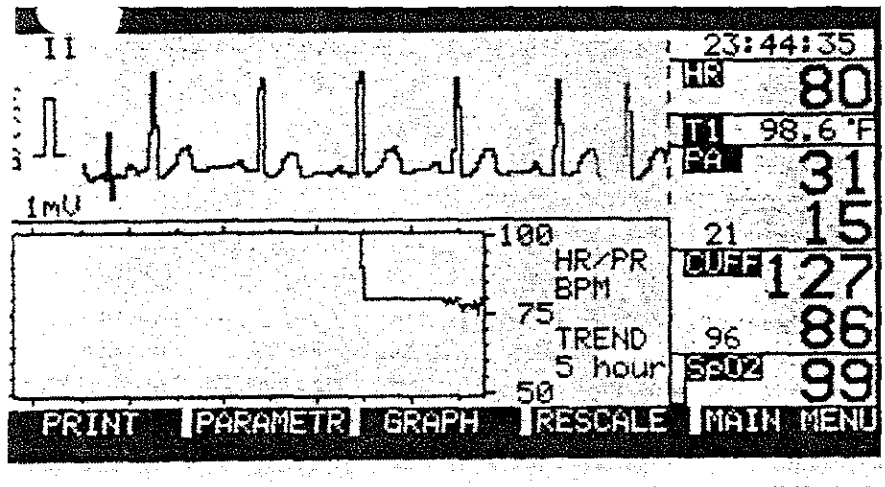
Graphical Trends

A graphical trend shows the trend values plotted against time with each point representing the patient's vital signs averaged over a two minute period.

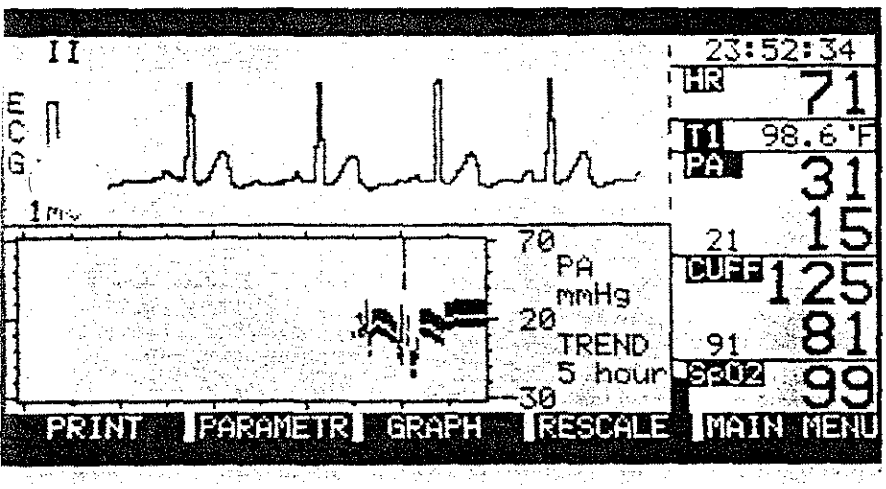
There are three types of graphical trends—single-point, two-point, and three-point graphs. Heart rate and oxygen saturation are single-point graphs. If only one temperature is monitored, it is also shown as a single-point graph; if two temperatures are monitored, they are shown as a two-point graph with the difference temperature shown between the two points. Blood pressure is a three-point graph with the trended systolic pressure at the top, the mean pressure in the middle and the diastolic pressure at the bottom. Examples of these graphs are shown in the following figures on the following page.

Except for cuff, all vital signs are continuously monitored from the time monitoring begins to the time it ends. If a monitored vital sign value dramatically changes (for example, goes to 0) at any time during monitoring, the value is considered a "real" value and averaged with other values, which affects the displayed trend value. This dramatic change can show up in the trend as a large difference between adjacent trend points. Continuously monitored values are always trended, except for the cuff measurement. Cuff is a special graphical trend situation.

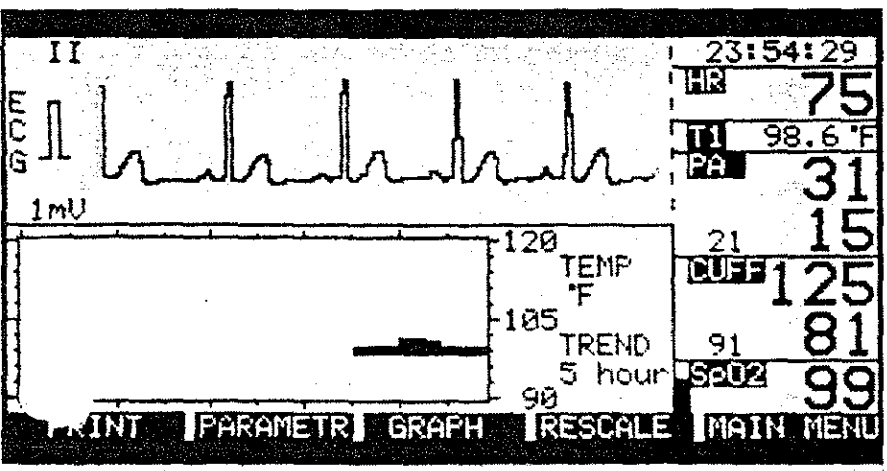
The Different Kinds of Trends



A single-point trend plots the values on a line. Each point represents the vital sign value averaged every two minutes. Heart rate/pulse rate, SpO_2, and a single temperature are plotted as single-point trends.

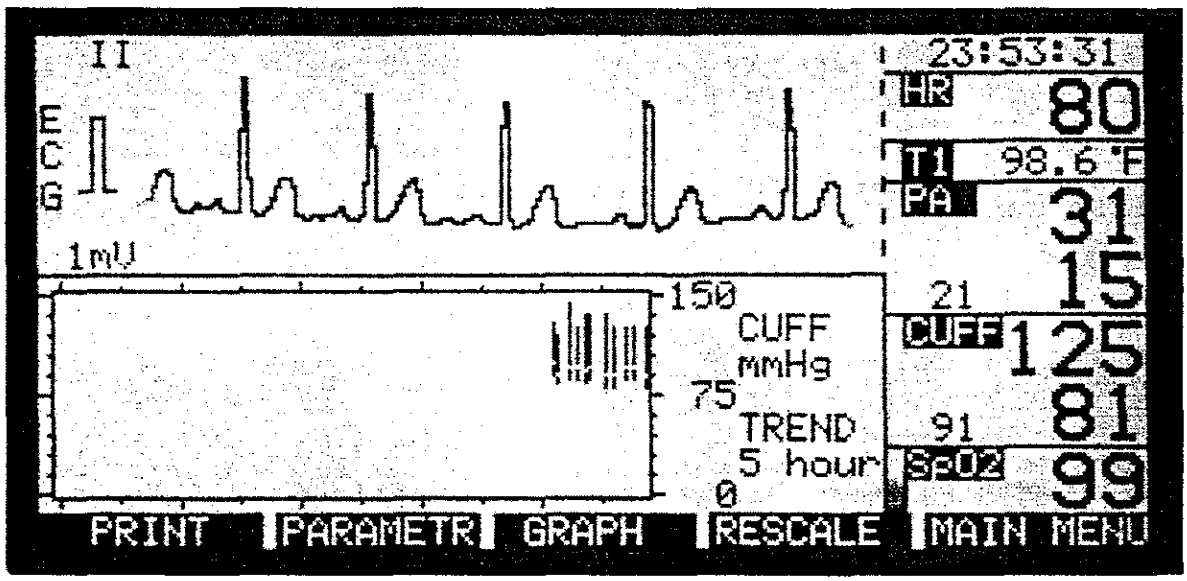


Blood pressure is always shown as a three-point trend because it displays the averaged systolic, diastolic, and mean values. The top line of the trend plot is the averaged values of systolic pressure; the blank spaces in the center of the plot are the mean values; and the bottom line of the plot is the diastolic values.



If two temperatures are monitored, they are always shown as a two-point trend. The top line of the trend plot is the averaged values of one temperature; the bottom line of the plot is the averaged values of the other temperature. The filled in area represents the difference between the two temperatures.

The smallest interval the Propaq can take cuff measurements is 30 seconds, except for cuff's turbocuf mode. The longest automatic cuff interval is 60 minutes. Cuff is not measured constantly like other vital sign parameters; cuff measurements are "discontinuous". When trends are averaged every two minutes, the Propaq averages only the cuff measurements it has actually taken. If over a two minute period, the Propaq obtained cuff measurements only twice, then only the results of those two measurements are averaged. The Propaq's cuff measurements are accurately trended.



Although cuff pressure is a discontinuous graph, the trend plot is read the same as invasive pressure.

Displaying Trends

Displayed trends show the last five hours of data. Trends are displayed only if you have one waveform turned on in the wave selection window, or, if more than one waveform is displayed, when you press the TREND button in the Display Menu.

Selecting a Trend (PARAMETR)

Except for temperature, all vital sign parameters are shown on their own trend graph. If two temperatures are monitored, both are shown on one graph. You select the trend you want displayed by pressing the PARAMETR button.

The trend is identified by a label to the right of the scale. The trend labels are

- HR/PR for heart rate/pulse rate as selected by the ♥SOURCE button
- P1, P2, ART, PA, CVP, and ICP for invasive pressures (the trend uses the selected label)
- CUFF for noninvasive pressures
- SpO_2 for oxygen saturation
- TEMP for T1, T2, and ΔT

Each time you press the PARAMETR button, the next trend is shown. To show the cuff's tabular trend, you first select the cuff trend with the PARAMETR button and then select the tabular trend with the GRAPH button.

Changing the Trend Scale (GRAPH & RESCALE)

Each parameter has three scales to allow the best viewing of the trend. Besides the three scales, the cuff trend can also show in a table the last five cuff measurements with the time and pulse rate. You select the desired scale by pressing the GRAPH button. The scales for each trend are listed in the following table.

Vital Sign Parameter	Lowest Values	Highest Values
Heart Rate/Pulse Rate	0 25 50	250 125 100
Invasive Pressure	0 30 -30	300 180 70
SpO_2	0 60 80	100 100 100
Cuff	0 0 50 Table of last five	300 150 100 Table of last five
Temperature (°F)	60 90 95	130 110 105
Temperature (°C)	10 25 30	50 45 40

The Propaq's ultrasmart capability can also automatically select the best graph for the current trend values with its rescale function. Each time you press the RESCALE button, the Propaq examines the highest and lowest values for each trend and automatically selects the scale for the best viewing of the trend.

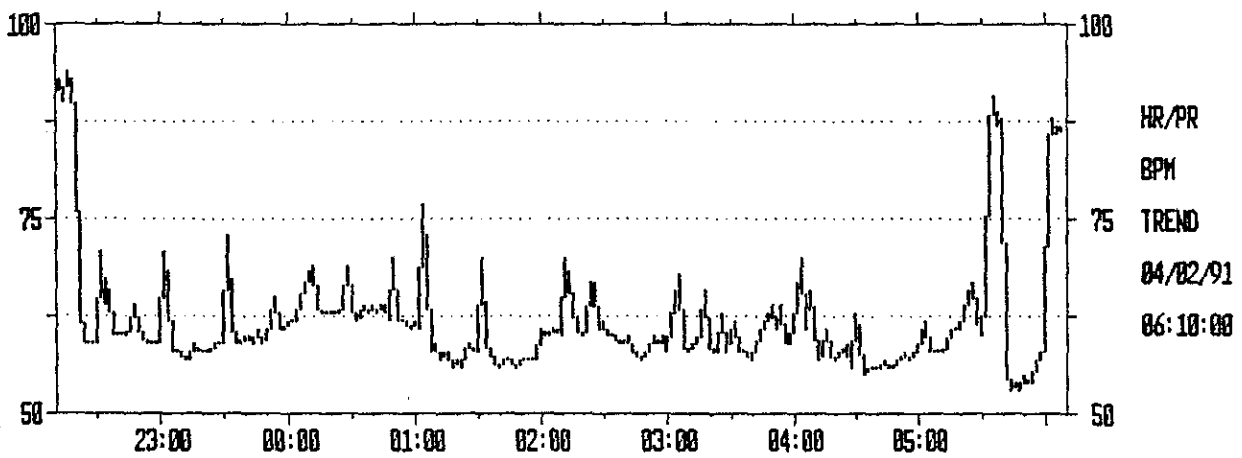
Printing Trends

Printed trends are useful for reviewing the patient's vital signs over the last several minutes to the last eight hours. Some hospital protocols require printed trends to accompany patient records for each work shift. The Propaq has made it easy for you to print one or several trends whenever you want or automatically at a selected interval.

Printing a Single Trend

The best way to print just one trend is with the PRINT button in the Trend Menu (see figure below). When you press the PRINT button, the displayed trend is printed using the scale shown on the display. However, instead of five hours of data, all eight hours of trend information is printed. If you want to print a trend different from the one displayed, press the PARAMETR button until the desired trend is shown. Press the GRAPH or RESCALE button to change the scale.

An example of a printed trend is shown below.



Printing Several Trends

To print several trends at one time, you could select each trend with the Trend Menu and print it using the PRINT button. But a much quicker way is to set up the printer to print the trends you want and then press the PR TREND button in the Printer Menu whenever you want the trends printed. Here's how you do it.

- ☞ From the Main Menu, press SYSTEM, then PRINTER, then PAGE. The printer trend select window (shown on the following page) appears. In this window you turn on the trends you want printed and turn off the trends you don't want printed.
- ☞ Using the NEXT and CHANGE buttons, select each of the trends you want printed and turn them on. Turn off all other trends.
- ☞ Press Main Menu.
- ☞ Using the Trend Menu, select each of the trends that is turned on in the trend select window and make sure the scale for the trend is the one you want printed. Press the GRAPH button to change the scale.
- ☞ Press Main Menu.
- ☞ Now, each time you want to print the selected trends, you simply press SYSTEM, then PRINTER, and then PR TREND. It's a good idea to do that right after you've set up the printer to print trends so you make sure the trends print just the way you want them.

inting Trends According to Shift

A common hospital protocol is to print trends for all monitored vital signs at the end of each work shift and place the printout in the patient's records. Work shifts usually run in 8-hour periods. You can set the Propaq to automatically print trends at 8-hour intervals by turning on the printer's AUTO TREND function and selecting the shift interval. Here's how you do it.

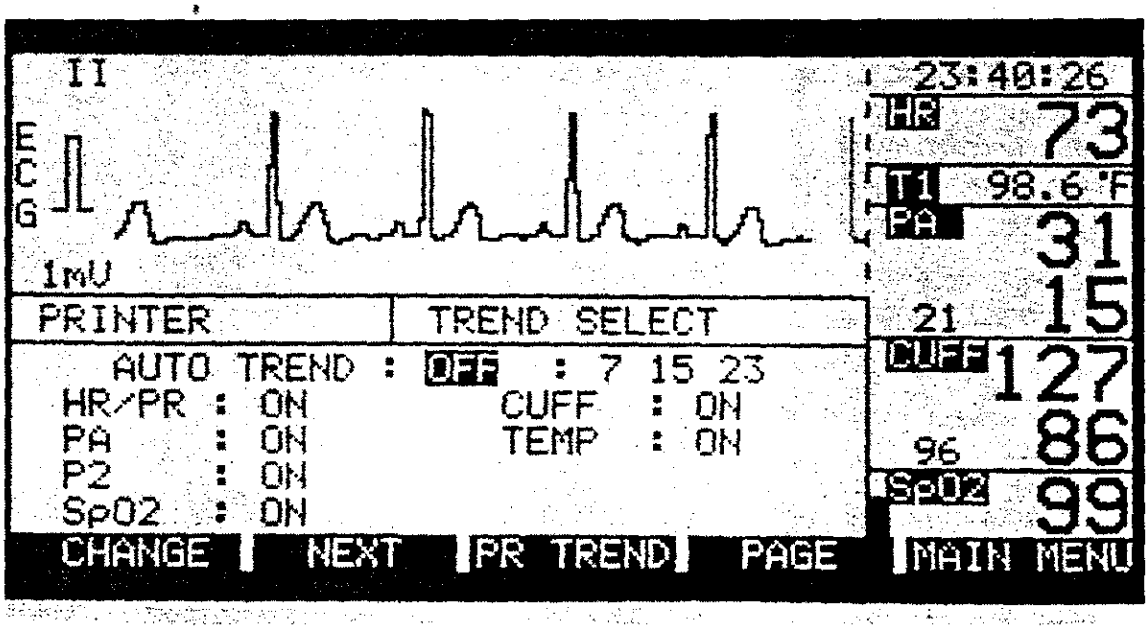
☞ Select the trends you want printed as described in the previous section, *Printing Several Trends*.

☞ After the trends are selected, press the PR TREND button in the Printer Menu to make sure the trends print just the way you want them.

☞ Set AUTO TREND on the trend select window to ON and then press the NEXT button to move the cursor to the print time.

☞ Use the CHANGE button to select the print times. Select the print time according to the start time (hour) of each shift.

Once the Propaq is set up, it will print all the selected trends at each 8 hour shift. All you have to do is detach the printout from the printer and place it in the patient's records.



5 ▪ Care and Maintenance

Cleaning

eaning Recommendations

The Propaq should be cleaned with bleach solution, hydrogen peroxide solution, gluteraldehyde, Cidex®, or warm water and a mild detergent. Isopropyl alcohol or other solvents should not be used for cleaning.

The cuff should be cleaned by sponging with a damp cloth. If washing is necessary, the air bladder should be removed and the cuff hand-washed with soap or detergent-disinfectant. After washing, the cuff should be air-dried.

Cables, cuff tubing, and accessories can be wiped with a damp cloth moistened in a mild detergent solution.

NOTE

The case of the Propaq has been specially designed to prevent water or other liquids from entering it. However, if moisture does get into the side panel connectors, the connectors must be dried with warm air, and then all monitoring functions should be checked for proper operation.

While cleaning the monitor, it should be checked for unusual wear or possible damage from an accident. All external cables and hoses should be checked for fraying or cracking. All damage should be reported to the biomedical department or biomedical repair service person.

Cleaning Agents

Use only the recommended cleaning agents listed below in the **OK To Use** column. The agents listed in the **Never Use** column should *never* be used on the Propaq.

WARNING

Do not autoclave this product.

OK To Use	Never Use
Warm Water	Butyl Alcohol
Mild Chlorine Bleach Solution	Isopropyl Alcohol
Hydrogen Peroxide Solution	Denatured Ethanol
Gluteraldehyde	Trichloroethylene (OK to use *trichloroethane*)
Cidex®	Freon
Acetone	
Liquid Soap	
Windex®	
Formula 409®	
Fantastik®	
Trichloroethane (never use *trichloroethylene*)	

Maintenance

ervice Interval Recommendations

At the intervals recommended below, and as further described in the *Propaq Technical Reference Guide*, verify the Propaq for proper operation of all channels and internal circuitry. Such checks and verifications should only be carried out by a qualified biomedical service person.

Other Propaq service information, including calibration procedures, is described in the *Propaq Technical Reference Guide*. Refer to it for more information.

Use the following intervals for a guideline. Service may be indicated more often in extreme environments (heat, cold, dust, etc.)

Recommended Interval	Service Action
Semi-annually	Complete Functional Verification and Safety Check
Minimum every three years	Replace lithium battery Replace battery pack Replace air filter
Every 5,000 hours of operation	Replace LCD Backlite (LCD monitors only)

Monitor Care

Storing the Monitor

Whenever possible, store the Propaq at room temperature in a dry environment. See the environmental storage specifications listed in this section and in Appendix B.

WARNING

The monitor may not meet its performance specifications if stored or used outside the specified temperature and humidity ranges listed in the specification tables in this section and Appendix B.

Extended Storage Precautions

Storing the Propaq for extended periods (more than one month) without being connected to the ac power adapter can cause damage to the battery. Even when the Propaq is turned off, a very small amount of current is drawn from the battery. If the Propaq is not connected to the ac power adapter, continual current draw can damage the battery if the battery voltage falls below 7.0 volts. For long-term storage, remove the battery from the Propaq. See the *Propaq Technical Reference Guide* for procedures on removing the battery.

Environmental Operating Limits

Operating the Propaq outside the following specifications may result in poor monitor performance.

Characteristic	Specification
Operating Temperature	0 to 50 °C
Operating Humidity	0 to 97%, noncondensing
Operating Altitude	-1,000 to 15,000 ft.
Shock	50 g
Vibration	0.025 in., 10 to 55 Hz, 75 minutes
Water Resistant	Drip Proof per MIL-T-28800

Environmental Storage Limits

Storing the Propaq outside the following specifications may result in poor monitor performance when the monitor is used.

Characteristic	Specification
Storage Temperature	-20 to 60 °C
Storage Humidity	0 to 97%, noncondensing
Altitude	40,000 ft.

Power Sources

For in-hospital operation and recharging from ac mains, a small ac power adapter plugs into the monitor. Use only a Protocol Systems ac power adapter to insure protection against leakage current hazards.

The Propaq can also be powered and recharged from a 10-32 volt dc source capable of continuously supplying 10.5 watts.

With the appropriate Protocol ac power adapter, the Propaq can be powered from the ac mains sources listed in the following table.

AC Mains	Range
North America	120 vac, 60 Hz
Japan	100 vac, 50-60 Hz
International (Other than North America and Japan)	220 to 240 vac, 50-60 Hz

Maximum Voltage to Inputs & Outputs

The combined leakage current of interconnected devices must not exceed 10 μA. Damage to the Propaq can result from applying more than the maximum voltages listed in the following table.

Location	Pin	Maximum Voltage
Analog Output	ECG	±10V
Analog Output	P1	±10V
Analog Output	SYNC	-1V to +6V

ıttery Care

The monitor can remain plugged into the ac adapter or connected to an external 10-32 vdc ≥10.5watt source. This ensures full battery charge when it is necessary to operate the monitor on the battery.

CAUTION

Leaving the monitor's lead-acid batteries in a completely discharged state may result in permanent battery damage. The batteries should be kept fully charged.

After 8 hours of recharging, the battery is at full capacity, if the monitor is off during recharging. After extended use on battery power, the Propaq displays a message to inform you of its low battery voltage. The Propaq automatically turns itself off when the battery voltage gets too low. Turning itself off prevents damage to the battery pack. You should connect the Propaq to the ac power adapter to recharge the battery as soon as possible after the monitor has turned itself off.

The amount of time you can run the Propaq on each battery charge depends upon many factors, but mostly on use of the backlight (LCD versions only) and how often you take blood pressure readings with the cuff. For long transports, you should use the **3 Min. Reset** backlight mode (see Chapter 1) and reduce the number of cuff measurements. If the battery power becomes too low to accurately take cuff measurements, the Propaq warns you of the condition and prevents further use of the cuff channel.

Battery Voltage Effects on Operation

Normal battery voltage during operation ranges from approximately 10 to 8.0 volts. As battery voltage decreases, the Propaq displays different messages to notify you of its current battery condition and automatically switches to different operating modes to extend battery operating time as long as possible. The following table summarizes the effects of low battery operation.

Voltage Level	Description	Approximate Operating Time at 25° C[a]
>8.0V	Normal	5.3 hours
≤7.9V	Flashing LOW BATT message	1.2 hours
=7.6V	Cuff channel and printer are inhibited.	0.5 hours
=7.3V	Equipment alarm; Propaq automatically switches to 3 Min. Reset backlight mode	0.05 hour
=7.0V	Unit Shutdown	

[a] With backlight ON and cuff set to AUTO with 15 minute intervals.

When the battery voltage falls below 7.3 volts, the Propaq automatically switches to the **3 Min. Reset** backlight operating mode (LCD versions only). An equipment alarm message also appears (see Chapter 3 for information on equipment alarms). If the backlight operating mode was set to **ON** (using the BACKLITE button), the Propaq switches back to **ON** when the battery voltage rises above 7.4 volts. The equipment alarm tone continues until the battery voltage rises above 7.4 volts.

Checking Battery Voltage

When the PROGRAM or TIME/DAY button is pressed, or when one of the Service Menu functions is selected, the battery voltage appears along with other information relating to the selected function.

Printer Maintenance

Loading Paper

Paper is loaded through the bottom of the Printer. Use only paper purchased or recommended by Protocol Systems, Inc. See Accessories in Appendix C for ordering printer paper.

CAUTION

Use only low-debris printer paper specified by Protocol Systems. Use of other paper will cause unclear printing of patient data, damage to printing head, and eventual printer failure. Store all paper (including a monitor loaded with paper) in an environment that meets the paper storage specifications listed in Appendix B. Failure to properly store paper can result in damage to the printer.

☞ Lay the monitor on its back to gain access to the bottom of the Printer.

☞ Squeeze the locks on the paper door toward each other and pull the door toward you to open it.

☞ Lift the paper roll from the holder and pull out any paper remaining in the printing mechanism.

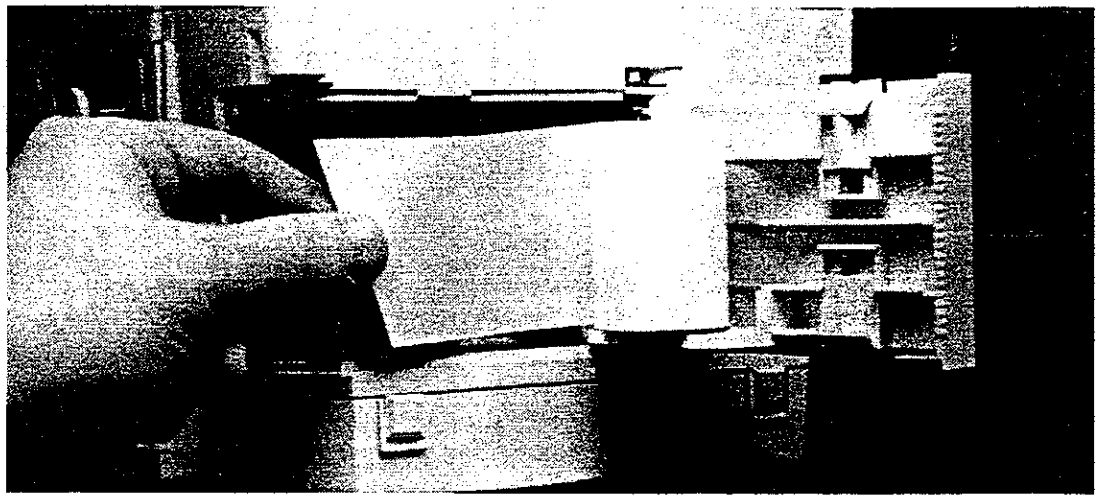
☞ Place the new paper roll onto the holder and pull out several inches of paper as shown on the following page (top figure).

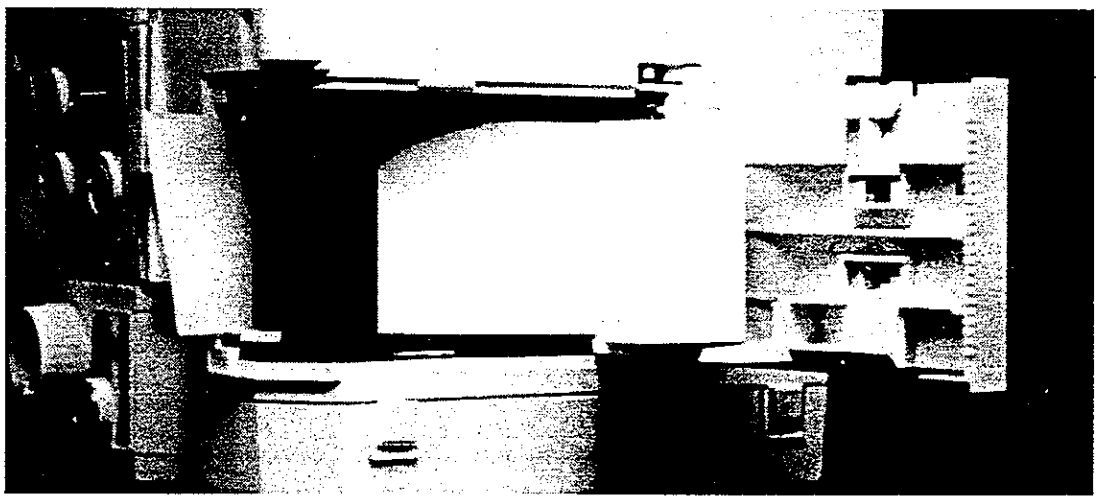
☞ Slide the end of the paper into the slot of the printing mechanism until it extends out of the paper exit slot (middle figure on next page).

☞ Close the paper door.

☞ Place the monitor on its feet.

☞ Hold down the PAPER FEED button and press START/STOP to produce a test print. Compare the printout to the bottom figure on the following page.





VER. 6.00.00 0004
55 DA 53 BC

Replacing the paper is a simple process of opening the printer door and removing the expired roll, inserting and threading the new roll, and closing the door and running a test print (simultaneously press PAPER FEED and START/STOP).

Customer Service Information

For ordering information, for the location of your nearest Protocol Systems sales representative or service center, or for more information on other Protocol Systems products, contact:

Protocol Systems, Inc.
8500 SW Creekside Place
Beaverton, OR 97005 USA
(503) 526-8500
In the USA, toll-free (800) 289-2500
FAX (503) 526-4200

A ▪ Glossary

3 Min. Reset Backlight Mode
The backlight mode used to view the monitor in low light conditions and still obtain maximum operating time.

ΔT
Difference temperature. The difference between T1 and T2.

AAMI
Association for the Advancement of Medical Instrumentation.

AC Power Adapter
The device that plugs into the 10-32 VDC receptacle on the Propaq's side panel to allow operation and battery charging from ac mains. Only Protocol Systems 503-0002-XX ac power adapter should be used.

Alarm Status Window
The window that appears when the ALARMS button is pressed. This window shows the alarm limits status of the vital sign parameters. A dark bell indicates that all alarm limits are set and turned on. A half-dark bell indicates that some alarm limits are off.

Alarms Parameter Window
The window that appears when the LIMITS button is pressed. This window lists all alarm limits by vital sign parameter. Alarm limits adjustment is done in this window.

Algorithm
A formula used in calculations. Certain algorithms are used to determine preset alarm limits using the STAT SET and PARAM SET buttons. (The alarm limit algorithms are shown in Chapter 3.)

Analog Output
The connector on the Propaq's side panel that outputs analog signals of ECG and P1. This connector also outputs a SYNC pulse.

Auto Interval (CUFF)
The interval at which cuff measurements are initiated when operating in the automatic mode.

Bell
The symbol that appears in a window to indicate alarm limits status. When a bell appears, alarms limits are set. See also Alarm Status Window.

BP
An acronym for Blood Pressure.

Blood Pressure Numerics Windows
The two larger windows below the heart rate. These windows can display invasive pressures and CUFF pressures.

Buttons
The five buttons along the bottom-front of the Propaq. A label can appear above each button identifying what each button will do when pressed.

Channel
See Patient Channel.

Configuration
The patient channels included with each Propaq model. A table in Chapter 1 lists the configuration of each Propaq model.

Cuff Status Window
The window that appears when the CUFF button is pressed. This window displays CUFF information.

Cursor
The dark block in a status window that indicates the selection you make by pressing the NEXT button.

DC Offset
The usually small voltage that occurs with the ECG signal causing the waveform to move vertically on the Propaq's display.

Difference Temperature
The difference between T1 and T2. Also called delta T (ΔT).

Digital Filter
A computer program in the Propaq that removes unwanted noise that can be induced into the ECG signal from ac mains.

Disable
The action taken by the DISABLE button when equipment alarms occur. A disabled patient channel can be used again by properly reconnecting the sensor cable (or in the case of CUFF, pressing the CUFF START button).

EL
An acronym for electroluminescent. This refers to the Propaq EL display option.

Equipment Alarm
An alarm that occurs when the Propaq detects an equipment condition requiring operator assistance. A message describing the condition is displayed.

Equipment Alarm Window
The window that appears during an equipment alarm.

Error Message
The message that appears when the monitor detects a malfunction requiring factory service.

Error Message Window
The window that appears when the monitor detects a malfunction requiring factory service. This window contains error messages and numbers.

Error Number
The number that identifies the problem encountered during operation.

Factory Default Settings
The current values for all Propaq settable functions when the monitor was shipped from the factory. These settings can be changed using the CURRENT button and reset using the DEFAULT button.

Freeze
The action taken by the FREEZE button. If three waveforms are displayed, all waveforms are frozen. If less than three waveforms are displayed, the current waveforms are frozen and the top waveform is also shown in real-time.

Graphic Trends
Trend plots in graphic form. Graphic trends represent the accumulation of five hours of data acquired at two-minute intervals.

Heart Rate Source
See Heart Rate/Pulse Rate Source.

Heart Rate/Pulse Rate
The heart rate derived from the heart rate/pulse rate source. See also Heart Rate/Pulse Rate Source.

Heart Rate/Pulse Rate Source
The source from which heart rate/pulse rate is derived. This source can be ECG, any pressure, including CUFF, or SpO_2. When the monitor is first turned on, the Propaq determines the most likely source for heart rate: ECG (first), P1 (second), SpO2 (third), P2 (fourth), and CUFF (last). The heart rate/pulse rate source can be changed using the ♥SOURCE button; however, CUFF cannot manually be selected as a source.

Highlight
The method of identifying a selected item on the display. Highlighted selections appear as light characters on a dark background. See also **Cursor.**

Horizontal Axis
The time axis of graphical trends.

HR
An acronym for heart rate. This is displayed when the heart rate/pulse rate source is ECG.

IBP Label
The two or three-character label that appears in the Blood Pressure Numerics Window identifying the source of blood pressure.

Invalid
When a channel, parameter, or alarm can no longer provide accurate information or is no longer used.

Labels
The names appearing above the buttons.

Last-viewed
The trend, parameter, graph, or window that was last to appear on the display.

LCD
An acronym for Liquid Crystal Display.

Liquid Crystal Display
One of the display screens used in the Propaq. The other is the EL display option. The LCD is a low power display and relies on available light or an adjustable backlight for viewing.

Menu
A group of labels above the buttons.

Numerics
The numbers that appear along the right side of the display for heart rate, blood pressure, temperature, alarm limits, etc.

P1
A generic label for invasive pressure channel one.

P2
A generic label for invasive pressure channel two (Model 106 only).

PR
An acronym for pulse rate. This is displayed when the heart rate/pulse rate source is from a pressure channel or SpO_2.

Parameter
See Vital Sign Parameter.

Patient Alarm
The condition that exists when a vital sign parameter numeric violates an alarm limit.

Patient Channel
ECG, P1, P2, T1, T2, SpO_2, and CUFF.

Pinout
The signal descriptions for each pin of a connector.

Polarization
The activity that occurs when dissimilar metals between ECG electrodes and leads meet. This can cause dc offset and other signal problems.

Pressure Label
See IBP Label.

Pulse Rate
The heart rate determined from either a pressure channel or SpO_2.

Pushbutton
See Buttons.

Quick Reference Guide
A companion document to the *User's Guide*.

Range Mode
The method used in invasive pressure display to show the waveforms against the same pressure scale.

Recover
See Trace Recovery.

Rescale Mode
The method used in invasive pressure display to show each waveform against its own scale. The scale is automatically selected for best viewing of the entire waveform.

Self Tests
Internal tests the Propaq initiates whenever it is turned on. If a fault is encountered during testing, an error message window, error message, and error number appear.

Sensors
The electrodes, transducers, probes, etc. used to obtain patient information.

Serial Number
The unique number assigned to the monitor. It is located on the rear panel label.

Shorthand Expression
A method used in the Propaq documents to indicate button presses which activate a certain function.

Software Version Number
The unique number assigned to the version of the Propaq's internal programming. This number appears in the Startup window.

Startup Window
The information window that appears while the monitor performs its power-up test just after you turn on the Propaq. This information includes the Propaq model number and software version number.

Status Window
A window that appears and contains information about the Propaq.

Tabular Trend
A tabular format for the CUFF trend display.

Technical Reference Guide
A companion document to the *User's Guide.*

Temporary Patient Alarm
An alarm limit violation that occurred and was corrected without operator intervention.

Trace Recovery
The method used to quickly return an ECG waveform on screen when a large dc offset has been sensed.

Trend
The accumulation of several hours of data acquired at two-minute intervals.

Trend Parameter
Heart Rate, P1, P2, SpO_2, Temperature, and Cuff.

Turbocuff Mode
The mode used to acquire as many CUFF measurements as possible in five minutes.

User's Guide
This User's Guide.

Valid
When a patient channel is properly connected and ready to acquire patient data.

Vertical Axis
The scale of a graphical trend.

Viewing Angle
The best angle at which the LCD can be viewed. Viewing angle is adjusted with the CONTRAST button.

Vital Sign Parameter
The measurements obtained from patient channels (such as, heart rate, systolic, diastolic, mean, pulse rate).

Waveform Window
The area in which waveforms are displayed.

Waveform/Status Window
See Waveform Window or Status Window.

Window
An area on the display screen in which information is displayed.

YSI
An acronym for Yellow Springs Instrument Company. This is a registered trademark.

Zeroing
The process by which an invasive pressure zero reference is obtained so that pressures can be related to atmospheric pressure.